

AMENDMENTS TO THE SPECIFICATION

Please amend the title of the Invention as follows:

PLAYBACK METHOD FOR AN INFORMATION RECORDING MEDIUM

Please add the following paragraph to page 1 after the Title of the Invention:

This is a Divisional Application of U.S. Application Serial No. 09/672,959, filed September 29, 2000, which is a Divisional Application of U.S. Application Serial No. 09/504,938, filed February 16, 2000.

Please amend the sub-heading at page 1, line 7 as follows:

~~<1. Field of The Invention>~~ Field of The Invention

Please amend the sub-heading at page 1, line 13 as follows:

~~<2. Related Art>~~ Related Art

Please amend the paragraph beginning at page 2, line 2 as follows:

For example, a convexo-concavo shaped guide groove has conventionally been formed on the signal recording face of the optical disc. While a signal has conventionally been recorded on only a land portion or a groove portion, it has become possible to record the signal on both the land and groove portions by a land-groove recording method. Consequently, a recording density has been enhanced by ~~approximate~~ approximately twice as much (see Japanese Patent Laid-Open Publication No. 8-7282, for example). Moreover, there has also been devised and practically used a zone CLV method or the like in which the control of a CLV method (constant linear velocity recording) effective in an enhancement in the recording density can be simplified and easily used practically (see Japanese Patent Laid-Open Publication No. 7-93873, for example).

Please amend the paragraph beginning at page 2, line 14 as follows:

~~A great~~ Significant problems in the future are how to record AV data including video data using an optical disc intended to have an increase in a capacity, and how to implement performance greatly exceeding a conventional AV apparatus and new functions.

Please amend the paragraph beginning at page 4, line 10 as follows:

The AV data read from a1 are input to the track buffer 13 and output from the track buffer 13 at a time t1, and the data are stored in the track buffer 13 by a rate difference ($V_a - V_b$) between an input rate (V_a) to the track buffer 13 and an output rate (V_b) from the track buffer 13. This state continues up to a2 (time t2). When an amount of data stored in the track buffer 13 for this period of time is represented by B (t2), ~~it is~~ it is sufficient that amount B (t2) stored in the track buffer 13 can be consumed to be continuously supplied to the decoder 16 ~~till~~ until a time t3 corresponding to data reading start point of a3.

Please amend the paragraph beginning on page 7, line 16 as follows:

Next, description will be given to a decoder for decoding the above-mentioned MPEG system stream. Fig. 38 shows a decoder model (~~P-STD~~) E-STD (Extended System Target Decoder) of the MPEG system decoder. The reference numeral 51 denotes an STC (System Time Clock) acting as a reference time in the decoder. The reference numeral 52 denotes a demultiplexer for decoding or demultiplexing a system stream. The reference numeral 53 denotes an input buffer of a video decoder. The reference numeral 54 denotes a video decoder. The reference numeral 55 denotes a reorder buffer for temporarily storing the I and P pictures to absorb a difference between the data order and the display order which is made between the I and P pictures and the B picture as described above. The reference numeral 56 denotes a switch for adjusting the order of the outputs of the I and P pictures stored in the reorder buffer and the B picture. The reference numeral 57 denotes an input buffer of an audio decoder. The reference numeral 58 denotes an audio decoder.

Please amend the paragraph beginning at page 10, line 13 as follows:

Fig. 40 is a diagram illustrating a relation between a tape and a tape recorder (recording head). As shown in the figure, recording areas for video data and audio data are separately provided in parallel with a tape running direction. Therefore it is easy to record audio data independently. In a conventional analog video tape recorder, reproduction and recording can be carried out simultaneously with one head since a delay time from reproduction to recording is almost zero.

Please amend the paragraph beginning at page 10, line 20 as follows:

The DVD-RAM expected as the next generation AV recording media for example has the following problems.

Please amend the paragraph beginning at page 10, line 22 as follows:

The biggest problem to an after-recording operation in the DVD recorder is caused by an MPEG stream which is AV data to be recorded by the DVD recorder and the difference of mechanism between a video recorder and the DVD recorder.

Please amend the paragraph beginning at page 11, line 23 as follows:

The DVD-RAM can store audio streams in various kinds of format. The DVD recorder can not know whether the DVD recorder can apply an after-record operation to the DVD-RAM in which data has been recorded by other recorders. Therefore the stream must be analyzed at start of data recording.

Please amend the paragraph beginning at page 12, line 4 as follows:

This invention is directed to provide information recording medium which actualize easy determination of a possibility of after-recording on the recording medium. This invention is also directed to provide an apparatus and a method for recording data to such a recording medium.

Please amend the paragraph beginning at page 12, line 18 as follows:

In a second aspect of the invention, an apparatus is provided for performing after-recording to an audio stream recorded on the recording medium according to the invention. The apparatus comprises a checking section for checking a possibility of after-recording operation to the recorder before after-recording operation starts, and an operation section for performing the after-recording operation.

Please amend the paragraph beginning at page 12, line 24 as follows:

In a third aspect of the invention, a method is provided for performing after-recording to an audio stream recorded on the recording medium according to the invention by using a recording apparatus. The method comprises referring to the bit rate information in the audio attribute information, determining whether or not the apparatus is able to encode the audio stream to be after-recorded in a bit rate of the bit rate information, and deciding that the apparatus ~~to be~~ is able to perform after-recording when the apparatus is determined to be able to encode the audio stream in the bit rate.

Please amend the paragraph beginning at page 13, line 7 as follows:

In accordance with the present invention, it is possible to determine whether or not the after-recording operation to an audio stream can be performed. Therefore, the recorder, for example, ~~gives~~ provides a warning to a user when the recorder does not have enough ability to process the audio stream for after-recording.

Please amend the sub-heading at page 13, line 12 as follows:

~~<Related Reference>~~ Related Reference

Please amend the paragraph beginning on page 15 of line 14 as follows:

Fig. 38 is a diagram showing the structure of an MPEG system decoder (~~P-STD~~). E-STD (Extended System Target Decoder).

Please amend the paragraph beginning at page 16, line 7 as follows:

Fig. 47 is a state transition diagram of an audio stream.

Please amend the paragraph beginning at page 16, line 8 as follows:

Fig. 48 is a block diagram of a DVD recorder in the first embodiment.

Please amend the paragraph beginning at page 16, line 10 as follows:

Fig. 50 is a block diagram of a DVD recorder with four track buffers.

Please amend the paragraph beginning at page 16, line 11 as follows:

Fig. 51 is a diagram illustrating an after-recording operation in the encoder.

Please amend the paragraph beginning at page 16, line 15 as follows:

Fig. 53 is a diagram illustrating the structure of a system controller in the second embodiment.

Please amend the paragraph beginning at page 16, line 17 as follows:

Fig. 54 is a flowchart of process on after-recording or dubbing by a DVD recorder in the second embodiment.

Please amend the paragraph beginning at page 16, line 19 as follows:

Fig. 55 is a flowchart of a check routine for checking possibility of an after-recording operation in the after-recording process.

Please amend the paragraph beginning at page 16, line 21 as follows:

Fig. 56 is a flowchart of a check routine for checking an attribute of an audio stream in the after-recording possibility check routine.

Please amend the sub-heading at page 17, line 3 as follows:

~~<First Embodiment>~~ First Embodiment

Please amend the paragraph beginning at page 20, line 24 as follows:

For the following purpose, the two audio streams are put in. A recording region for the after-recording operation, that is, a recording band is kept. In addition, if the attribute of the audio stream to be after-recorded, that is, a ~~coding~~ coding mode and a bit rate are set identical to that of the audio stream recorded in a dummy, a pack and a packet ~~header~~ header become completely identical and the after-recording operation can be carried out only by exchanging the contents of the payload.

Please amend the paragraph beginning at page 21, line 23 as follows:

For example, in the case where a part of the VOB is to be after-recorded, when the data recorded as the stream #2 are silent or have insignificant contents, for example, insignificant data and significant data are switched with each other on the boundary between a after-recorded portion and a non-after-recorded portion.

Please amend the paragraph beginning at page 22, line 3 as follows:

Since the DVD recorder has only one audio decoder, the stream #1 and the stream #2 cannot be played back at the same time. Accordingly, when the partial after-recording operation is to be carried out, it is necessary to designate the audio stream to be played back to a decoder so as to switch the audio stream from original data to after-recorded data or from after-recorded data to original data on the boundary portion. The audio stream to be played back is generally designated by control ~~form~~ from the host side, that is, a microprocessor. Therefore, it is hard to designate the switching in a frame unit.

Please amend the paragraph beginning at page 23, line 22 as follows:

The above-mentioned state is managed in an Application Flag on the DVD-RAM disc

Please amend the paragraph beginning at page 26, line 18 as follows:

The input and output of the track buffer will be described in a time series with reference to Fig. 52.

Please amend the paragraph beginning at page 29, line 17 as follows:

Next, the system controller 7802 gives a request for a writing end process to the drive 7808. The drive 7808 overwrites and records all the VOB data remaining in the track buffer2 and the track buffer4 on the DVD-RAM disc and informs the system controller 7802 that the after-recording process is completed after the completion of the recording operation.

Please amend the paragraph beginning at page 31, line 1 as follows:

When the same audio streams or the same audio contents are recorded in the audio stream #2, an error message is displayed for the user. This prevents the user from thinking that the switching is has failed or that the DVD recorder is out of order, because the user performing the switching operation of the audio stream expects the playback of an audio stream different from the audio stream #1, however just the same audio is played back in this case even if audio stream to be played back is switched to the audio stream #2.

Please amend the sub-heading at page 32, line 10 as follows:

~~<Second Embodiment>~~ Second Embodiment

Please amend the paragraph beginning at page 33, line 4 as follows:

The DVD and DVD recorder in this embodiment have basically the same structure as in the first embodiment, and are characterized by a method of having a management information on the disc and the operation of a recorder for performing the after-recording process. In the present embodiment, the difference from the first embodiment will be mainly described.

Please amend the paragraph beginning at page 35, line 18 as follows:

The playback sequence is defined as a sequence (PGC) of a cell indicative of a partial or whole interval of the M_VOB and the S_VOG. The playback sequence has two kinds of parts, that is, an original PGC and a user-defined PGC. The original PGC refers to all the AV data in the disc. The user-defined PGC defines a playback order of AV data which the user selects in the disc (plural definitions can be obtained). The original PGC is also called a program set (Program Set), and includes a layer which is called a program (Program) having a plurality of cells logically bundled there between. The user-defined PGC is also called a play list (Play List) and includes no Program there between differently from the original PGC.

Please amend the paragraph beginning at page 49, line 14 as follows:

The date and time on which the VOB was recorded is recorded therein in the same format as in the PL_CREATE_TM shown in Fig. 9. It is important that the recording date and time indicates the recording date and time of the display video frame of the VOB head and the VOB_REC_TM should also be corrected when the VOB head video frame is changed by edit or partial erasure. When the recording date and time is to be displayed synchronously with the reproduction of the VOB as often seen in a ~~cam-coder~~ camcorder, the recording date and time is possible to obtain by adding an elapsed time in the VOB to the VOB_REC_TM.

Please amend the paragraph beginning at page 50, line 7 as follows:

M_VOB_STI number corresponding to the VOB is recorded therein. ~~M_VOB#STI~~
M_VOB_STI number shown herein is the recording order in the above-mentioned M_VOB_STI table.

Please amend the paragraph beginning at page 61, line 1 as follows:

Input Source Code:

60h : Broadcasting station

61h : ~~Cam-coder~~ Camcorder

62h : Photograph

63h : Memo

64h : Others

Please amend the paragraph beginning at page 67, line 4 as follows:

The DVD-recorder of this embodiment has almost the same structure as the one of the first embodiment but differs in the following point. That is, in the DVD-recorder, the system controller 7802 includes an after-recording check section 78021 and an after-recording operation section 78022 for performing after-recording as shown in Fig.53.

Please amend the paragraph beginning at page 67, line 9 as follows:

Though the operation of the recorder of this embodiment is almost same as in the first embodiment, ~~great different point~~ a significant difference is that the after-recording check section 78021 in the recorder of this embodiment checks in advance whether the recorder has an ability to perform after-recording for an audio stream which is intended to be after-recorded.

Please amend the paragraph beginning at page 67, line 14 as follows:

As described above, the optical disc of this embodiment has bit rate information ("Bitrate") as attribute information of a dummy audio stream provided for after-recording in addition to audio coding mode information, and information of number of audio channels.

Please amend the paragraph beginning at page 67, line 18 as follows:

With reference to the audio attribute information, the DVD recorder checks in advance whether or not the recorder can perform an after-recording operation by using the dummy audio stream.

Please amend the paragraph beginning at page 67, line 21 as follows:

Concretely, it is determined whether the after-recording operation is possible or not by comparing audio coding mode, audio channel number and bit rate with an encode ability of the DVD recorder.

Please amend the paragraph beginning at page 67, line 24 as follows:

When the after-recording operation is determined to be possible, the after-recording operation is performed as in the first embodiment. When the after-recording operation is determined to be impossible, the user is notified that the after-recording operation is impossible via the user interface 7801 in a predetermined manner (for example, to display message). This operation is described below with reference to flow charts in Figs. 54, 55 and 56.

Please amend the paragraph beginning at page 68, line 5 as follows:

Referring to Fig. 54, ~~on~~ upon receiving a user request for after-recording to a desired program (PG) via the user interface 7801 (S1), the system controller 7802 reads in movie VOB information (M_VOBI) and movie VOB stream information (M_VOB_STI) related to the designated program (PG) (S2). Then, the possibility of an after-recording operation in the recorder is checked (S3). That is, it is determined whether or not the after-recording operation is possible with reference to M_VOBI and M_VOB_STI (S3). With the result, when the after-recording operation is determined to be possible (S4), the controller starts the after-recording operation (S5). When the after-recording operation is determined to be impossible (S4), the controller notifies the user that the after-recording operation is impossible (for example, displays message) (S6).

Please amend the paragraph beginning at page 68, line 16 as follows:

The check routine of the possibility of the after-recording operation (step S3) is performed as follows in accordance with the flowchart of Fig. 55.

Please amend the paragraph beginning at page 68, line 18 as follows:

The controller checks number of audio streams based on AST_Ns of M_VOB_STI (in Fig. 12) (S31). When there are two audio streams (S32), attribute of each audio stream is checked or ~~determine~~ determined whether or not each audio stream is in a state where it is possible to perform the after-recording operation to the stream (referred to as "after-recordable state") (S33). Details of this process will be described later. With the result of the check, when the audio stream is in after-recordable state (S34), coding mode ("Audio Coding Mode") (see Fig. 13) in A_ATR1 of M_VOB_STI is checked (S35). When an encoder of the DVD recorder is operable in the checked coding mode (S36), bit rate ("Bitrate") in A_ATR1 of M_VOB_STI is checked (S37). When the encoder is operable in the checked bit rate (S38), it is decided that the after-recording operation is "possible" (S39). Otherwise, it is decided that an after-recording operation is "impossible" (S40).

Please amend the paragraph beginning at page 70, line 1 as follows:

While in this embodiment the recorder is provided for the DVD-RAM disc, this invention is not limited to DVD-RAM but applicable to re-writable disc.